

Fine Mapping of a Gametophytic Factor Controlling Unilateral Incompatibility in Tomato

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Unilateral incompatibility or incongruity (UI) is a pollen rejection phenomenon, typically occurring in the style, that prevents hybridization of related species in one direction -- most often when a self-incompatible species is pollinated by a self-compatible one (the 'SI × SC rule'). Among the wild relatives of tomato, virtually all of the green-fruited species – whether SI or SC – reject pollen of *Solanum lycopersicum* by UI. Of significance to breeders, UI effectively prevents transfer of the maternally-inherited cytoplasmic genomes, which might encode useful traits such as CMS. The wild nightshade *S. lycopersicoides* (SI) rejects pollen of cultivated tomato by UI, as does the F1 *S. lycopersicum* × *S. lycopersicoides* hybrid. Pollen of *S. pennellii*, on the other hand, is compatible with styles of *S. lycopersicoides* and its hybrids with tomato; we previously demonstrated that up to three gametophytic factors, located on chromosomes 1, 6 and 10, determine pollen compatibility or incompatibility. The chromosome 1 factor maps at or near the S locus, suggesting pollen-S may be the gene underlying this locus. The chromosome 6 factor, herein referred to as *ui6.1*, acts in concert with the S-linked product: pollen must carry the *pennellii* alleles at both loci to overcome UI on *S. lycopersicum* × *S. lycopersicoides* hybrids. To fine map *ui6.1*, we genotyped approx. 7,000 progeny of *S. pennellii*-derived bridging lines carrying the chromosome 1 and 6 factors. The frequency of recombination around *ui6.1* was highest in progeny of plants heterozygous for long introgressions, and in products of female meioses. The recombinant plants were phenotyped by pollination onto styles of *S. lycopersicum* × *S. lycopersicoides* hybrids to determine compatibility. In this way, the *ui6.1* locus was mapped to an interval of less than 20 kb, which, by sequence analysis, contains two genes. The expression of these genes in different tissues is being studied in order to determine if either one is a likely candidate for *ui6.1*. This research is part of an NSF Plant Genome Program grant on Interspecific Reproductive Barriers in tomato.